(12) AUSTRALIAN PATENT ABSTRACT
(19) AU

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(54) INTERNAL COMBUSTION ENGINE

(75) CHARLES RADCLIFF FURLONGER

(21) 15966/83 (22) 23.6.82 (23) 20.6.83 (24) 23.6.82

(43) 5.1.84

(51)[3] F02B 21/00 F02B 29/00 F02B 9/02

(57) Claim 1. An engine including a piston within and associated cylinder and means so as to define a variable working volume within the cylinder such that the working volume for one cycle is less than the working volume for another cycle.

15966/83

COMMONWEALTH OF AUSTRALIA

Patents Act 1952

APPLICATION FOR A STANDARD PATENT OR A STANDARD PATENT OF ADDITION

I CHARLES RADCLIFF FURLONGER

of 2/4 STANLEY STREET, INDOOROOPILLY QUEENSLAND 4068

hereby apply for the grant of a standard patent ~~patent of addition~~ for an invention entitled IMPROVEMENTS IN OR RELATING TO INTERNAL COMBUSTION ENGINES

COMPLETE ~~NOT PROVISIONAL~~ SPECIFICATION No. 15966/83

which is described in the accompanying provisional ~~complete~~ specification.

(To be included in the case of a Convention application)

Details of basic application(s) –

Number of basic application

Name of Convention country in which basic application was filed

Date of basic application

(To be included in the case of an application made by virtue of section 51)

Number of original application

Person by whom made

(To be included in the case of an application for a patent of addition)

I request that the patent may be granted as a patent of addition to the patent applied for on Application No. Patent No.

in the name of

I request that the term of the patent of addition be the same as that for the main invention or so much of the patent for the main invention as is unexpired.

RECEIVED Date 23 JUN 82 21549

My address for service is 2/4 STANLEY STREET, INDOOROOPILLY Q 4068

Dated this TWENTY FIRST day of JUNE 1982

To

THE COMMISSIONER OF PATENTS

(Signature)

This form must be accompanied by either a provisional specification (Form 9 and true copy) or by a complete specification (Form 10 and true copy).

* These sections are to be completed only where applicable.

C. J. Thompson, Commonwealth Government Printer

TRADE MARKS OFFICE 23 JUN 82 BRISBANE

TEN DOLLARS

15966/83

Form 7

COMMONWEALTH OF AUSTRALIA

Patents Act 1952

DECLARATION IN SUPPORT OF AN APPLICATION FOR A PATENT

In support of the Application made by CHARLES RADCLIFF FURLONGER

for a patent for an invention entitled IMPROVEMENTS IN OR RELATING TO INTERNAL COMBUSTION ENGINES

I, CHARLES RADCLIFF FURLONGER

of 2/41 STANLEY ST., INDOOROOPILLY Q 4068

do solemnly and sincerely declare as follows:—

1. I am the applicant for the patent.

(or, in the case of an application by a body corporate)

X 1. I am authorized by ..... the applicant for the patent to make this declaration on its behalf.

2. I am the actual inventor of the invention.

(or, where a person other than the inventor is the applicant)

X 2. ..... of ..... is the actual inventor of the invention and the facts upon which I am the ..... is entitled to make the application are as follows:—

.....

.....

.....

TO .....

Declared at BRISBANE this TWENTY THIRD day of JUNE 19 82

TO:

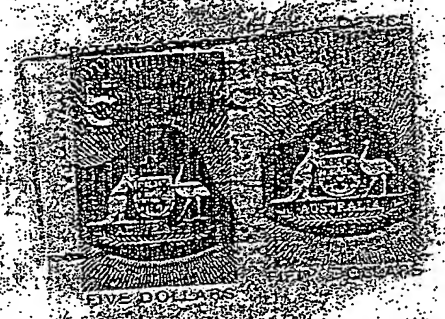
THE COMMISSIONER OF PATENTS.

.....

(Signature of Declarant)

(IMPORTANT – Cross out inapplicable words in the above Form.)

C. J. Thompson, Commonwealth Government Printer



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The Patents Act 1952-1969

Name of Applicant: CHARLES RADCLIFF FURLONGER

Address of Applicant: 2/4 Stanley Street
INDOOROOPILLY, QLD. 4068

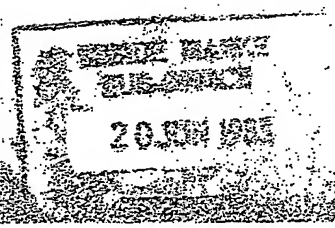
Actual Inventor: CHARLES RADCLIFF FURLONGER

Address for Service: 2/4 Stanley Street, Indooroopilly, in the State of Queensland, Commonwealth of Australia.

COMPLETE SPECIFICATION FOR THE INVENTION ENTITLED:

"IMPROVEMENTS IN OR RELATING TO INTERNAL COMBUSTION ENGINES"

The following statement is a full description of the invention including the best method of performing it known to me:



THIS INVENTION relates to an increased efficiency of internal combustion engines.

Hitherto, internal combustion engines have been thermally inefficient because a high proportion of the energy generated by the combustion process has escaped through the exhaust system in the form of gas pressure and heat. Because the volume of fuel/air mixture that is compressed for ignition equals the volume over which the burning gas is allowed to expand, this loss of energy is unavoidable.

The object of this invention is to modify conventional reciprocating internal combustion engines so that the volume within the cylinder, or cylinders, over which the burning fuel/air mixture is allowed to expand is greater than the volume of mixture as compression begins to take place. The ratio between the expansion and compression volumes can be varied during construction to suit particular applications and up to a maximum of about 3:1 at which stage the pressure of the gas within the combustion area at the completion of the power stroke has reduced almost to ambient pressure before being allowed to escape through the exhaust system. Thus, maximum energy can be recovered from the expanded gas and exhaust noise practically eliminated. Hereinafter, a volume ratio of 3:1 will be used to explain the operation of this invention. In accordance with the invention, the working volume of the piston with regard to an associated cylinder is the volume of the cylinder above the piston and varies in accordance with the reciprocating movement of the piston within the cylinder.

The internal combustion engine of the invention will be similar to any two-cycle or four-cycle engine except that by modified inlet valve opening periods or by the inclusion of an additional valve, hereinafter

referred to as the transfer valve, about two-thirds of the volume of the mixture otherwise compressed will be expelled into a retaining chamber before the valve closes and compression of the remaining one-third of the mixture begins to take place. Thus, the working volume of the mixture to be compressed will be proportionally less than the working volume over which the burning gas is able to expand. The mixture retained in the chamber is then used during the subsequent induction cycle with the one-third portion used during the previous power cycle being replaced through the induction system in the conventional manner. Compression ratios will therefor be the ratio between the swept volume after closure of the inlet or transfer valves and the combustion chamber volume at the point of maximum compression of the fuel/air mixture.

The embodiment of this invention will now be more fully described with reference to the accompanying drawings, wherein:

Fig 1 shows the end elevations of a cam used to operate a conventional inlet poppet valve and that of a similar cam modified to produce a cylinder volume ratio of about 3:1.

Fig 2 is a cutaway view of an inlet manifold showing a simple reed valve located over the manifold inlet port to maintain, in certain cases, positive pressure within the manifold.

Fig 3 is schematic sectioned elevation of a cylinder head showing the transfer valve for embodiment of the invention in two-cycle engines.

Figures 1 and 2 relate to the embodiment of the invention in a four-cycle engine. The engine is essentially a modified conventional four-cycle reciprocating internal combustion engine wherein the cams

operatively connected to the inlet valves are reshaped to conform approximately with the cam profile in Fig 1 (b) to give an expansion to compression volume ratio of 3:1. In operation, the inlet valve is held open for about 300 degrees of crankshaft rotation and will therefore close at about 60 degrees before the piston reaches the point of maximum compression. Thus the valve is open during 120 degrees, or two-thirds, of the compression stroke thereby allowing about two-thirds of the induced mixture to be expelled from the cylinder into the inlet manifold. After the inlet valve has closed the remaining one-third of the mixture is compressed, ignited and expanded in the conventional manner.

For embodiment of this invention in single cylinder engines, or multi-cylinder engines which do not have an induction stroke occurring during the first 120 degree rotation period of compression in another cylinder, a modified induction manifold as shown in Fig 2 is necessary. In such cases the inlet manifold pressure will rise above ambient air pressure for short periods and the mixture will tend to be expelled to atmosphere through the manifold inlet. The reed valve 1, shown covering the manifold inlet port 2 (dotted outline) in Fig 2, will retain positive pressure within the manifold but will open to admit air or fuel/air mixture as manifold pressure reduces below ambient pressure. Engines employing direct fuel injection to the cylinders will not need any such modification since the air induced into the cylinders contains no fuel and there would be no fuel loss if a proportion of the air escaped to atmosphere.

For embodiment of this invention in two-cycle engines, a transfer valve 4 is provided in the cylinder head as shown in Fig 3. Such valve is operated in the

conventional manner by a cam rotating at crankshaft speed. The cam is shaped to hold the valve open for about 120 degrees of rotation and timed to begin opening the valve at about the conclusion of the outward stroke of the piston. The valve will therefore close after about two-thirds of the inward movement of the piston within the cylinder thus retaining one-third of the mixture for compression. The mixture expelled through the transfer port 3 is conducted through a tube connected directly to the crankcase and will be used during the subsequent cycles.

In all cases, the embodiment of this invention will require the compression ratio of the engine to be the ratio between the cylinder volume at the instant of closure of the inlet or transfer valves and the final volume of the cylinder as the piston reaches the most inward point of movement.

Of course all such and other modifications and variations to the above prescribed embodiment as would be apparent to persons skilled in the art are deemed to fall within the broad scope and ambit of this invention as is set forth in the appended claims.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. An engine including a piston within and associated cylinder and means so as to define a variable working volume within the cylinder such that the working volume for one cycle is less than the working volume for another cycle.

2. An engine according to claim 1, constructed to employ the four-cycle principle wherein said means for defining unequal working volumes is a cam operatively connected to the inlet valve and so shaped to prolong the open period of said inlet valve such that a proportion of the induced fuel/air mixture is returned through said inlet valve to an inlet manifold.

3. An engine according to claim 2 and means for retaining said proportion of fuel/air mixture within said inlet manifold whenever fluid pressures therein exceed ambient pressure.

4. An engine according to claim 3 wherein said means includes a valve or valves associated with the inlet or inlets to said manifolds, said valve or valves being operated by fluid pressure such that fluid can enter said manifold from atmosphere but is unable to return to atmosphere.

5. An engine according to claim 1 constructed to employ the two-cycle principle wherein said means for defining unequal working volumes is a transfer valve provided in the closed end of the cylinder, said transfer valve being timed to open and close such that a proportion of the fuel/air mixture within said cylinder is expelled through said transfer valve.

6. An engine according to claim 5 and means to transfer said proportion of expelled fuel/air mixture to the engine crankcase for use during subsequent cycles.

7. An engine according to claim 6 wherein said means is a tube coupled to said transfer valve outlet port

and to said crankcase such that fluid can pass from the former to flatten without losses to atmosphere.

8. An engine as claimed in the above claims, and described with reference to the accompanying drawings.

9. An internal combustion engine substantially as herein before described with reference to the accompanying drawings.

DATED THIS 20th day of June, 1983.

CHARLES RADCLIFF FURLONGER.

a. Fig. 1. b.

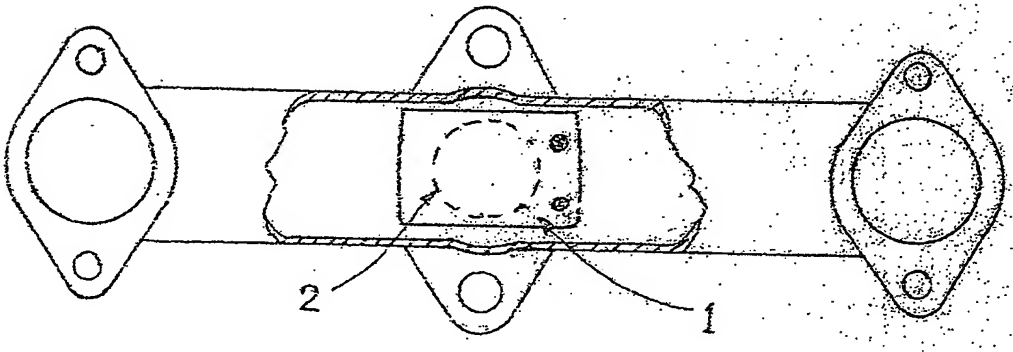


Fig. 2.

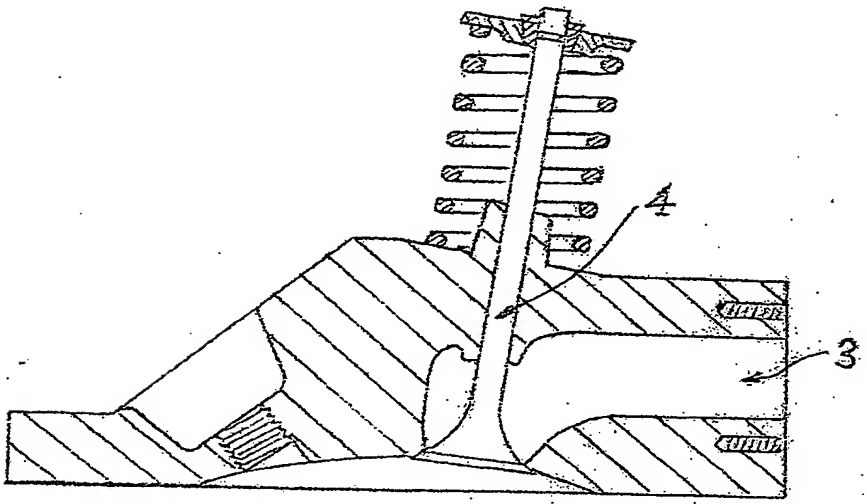


Fig. 3.